
An optogenetic toolbox designed for primates.

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Public Summary:

Scientific Abstract:

Optogenetics is a technique for controlling subpopulations of neurons in the intact brain using light. This technique has the potential to enhance basic systems neuroscience research and to inform the mechanisms and treatment of brain injury and disease. Before launching large-scale primate studies, the method needs to be further characterized and adapted for use in the primate brain. We assessed the safety and efficiency of two viral vector systems (lentivirus and adeno-associated virus), two human promoters (human synapsin (hSyn) and human thymocyte-1 (hThy-1)) and three excitatory and inhibitory mammalian codon-optimized opsins (channelrhodopsin-2, enhanced *Natronomonas pharaonis* halorhodopsin and the step-function opsin), which we characterized electrophysiologically, histologically and behaviorally in rhesus monkeys (*Macaca mulatta*). We also introduced a new device for measuring in vivo fluorescence over time, allowing minimally invasive assessment of construct expression in the intact brain. We present a set of optogenetic tools designed for optogenetic experiments in the non-human primate brain.

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